

[54] **PRECISION HYDRAULIC LIFTING DEVICE**

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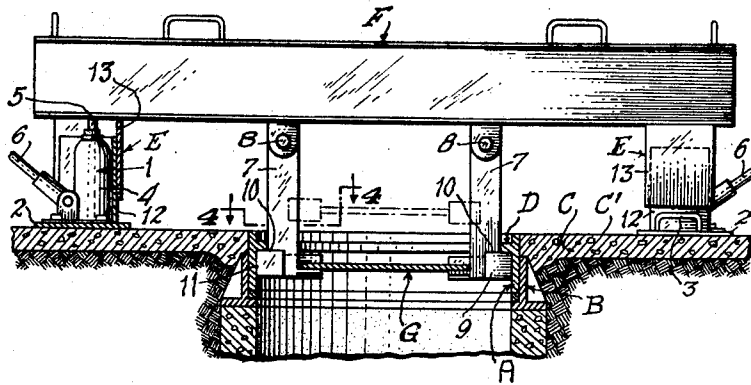
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[57] **ABSTRACT**

A lifting device adapted to the precise vertical translation and control of various objects, includes jacks to be located at opposite sides of the object to be raised and each to support one end of a load-carrying bar which has lifting arms each pivotally connected at one end to said bar and formed at its other end with fingers to engage the object at opposite sides of the object to be raised and each to support one end of a load-carrying bar which has lifting arms each pivotally connected at one end to said bar and formed at its other end with fingers to engage the object at opposite sides thereof, and a spreader bar to positively spread said arms apart and rigidly hold said fingers in lifting engagement with said object.

**10 Claims, 4 Drawing Figures**





## PRECISION HYDRAULIC LIFTING DEVICE

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The invention relates to a hydraulic lifting device of the type wherein there is a load-carrying bar supported at its ends on hydraulic jacks disposed at opposite sides of an object to be lifted, such as a manhole frame, a valve box, or a catch basin, said bar having connected thereto means to engage such object through an opening therein so that the object can be lifted vertically upon elevation of said bar by said jacks.

## 2. The Prior Art

In the prior art devices, the means for engaging the object are either complicated and expensive or their form and their association with the load-carrying bar is such that the object is not precisely and rigidly gripped by said engaging means or the engaging means is free to swing and tilt in all directions on said bar which hinders the operation of connecting said engaging means with the object and makes precise and controlled vertical lifting of the object difficult and excessively time-consuming.

In the prior art devices, the operative connections between the load-carrying members and the hydraulic jacks are complicated and make difficult the assembly and disassembly of said members and the jacks.

## SUMMARY

A primary object of the present invention is to provide a device which will overcome the difficulties and disadvantages incident to the construction and use of the prior art devices, and which at the same time will provide for rapid precise and controlled vertical lifting of objects.

The invention also contemplates such a device wherein the means for engaging the object comprise lifting arms each pivotally connected at one end to the load-carrying bar and formed at its other end with fingers to engage the object at opposite portions of the wall thereof, and a rigid spreader bar removably insertable between said arms to positively spread them apart and force said fingers into engagement with said portions of the wall of the object.

Another object of the invention is to provide novel and simple means providing for easy and quick assembly of the load-carrying bar and the lift means, for example, a jack, into operative relation and for easy and quick separation of said bar and said lift means out of operative relation.

## A BRIEF DESCRIPTION OF THE DRAWINGS

For a complete understanding of the invention, reference should be had to the following description and the accompanying drawings in which:

FIG. 1 is a central vertical sectional view through a manhole frame and portions of a pavement of known construction, and a side elevation of lifting apparatus embodying the invention with portions thereof shown in sections;

FIG. 2 is a disassembled perspective view of parts of the lifting apparatus and the manhole frame in disassembled relation;

FIG. 3 is an enlarged perspective view of the spreader bar for holding the lift arms in spaced apart relation as shown in FIG. 1, and

FIG. 4 is a fragmentary horizontal sectional view on the plane of the line 4—4 of FIG. 1.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purpose of illustrating the principles of the invention, the object to be lifted has been shown as the circular tubular lid support wall A which is vertically adjustably mounted in a manhole frame B for an access opening to underground electrical cables, drainage conduits, etc., and extends through a pavement C. Extending from the support wall and into the opening therethrough is a lid-supporting flange, diametrically opposite portions of which are adapted to cooperate with the apparatus for vertically lifting the support wall A for adjustment of the wall relatively to the fixed manhole frame, for example, so as to locate the upper edge of the wall in proper position relative to the surface C' of the pavement, according to known practice.

The lifting apparatus comprises two lift means E each to be set at one of opposite sides of the object to be lifted, in the present instance the support wall A, and each to separably support one end of the load-carrying bar F. Each lift means is shown as comprising a known type of hydraulic jack 1 having a base plate 2 with handles 3 to movably set on the pavement surface C'. Each jack has a piston in a cylinder 4 from which extends a vertical piston rod 5 upward and downward movement of which is controlled by the usual handle 6 and associated valves. Manifestly, other types of jacks can be used.

The load-carrying bar F is shown as an I-beam of adequate length to transversely span the object to be lifted and to removably set on the exposed ends of the piston rods 4. Depending from the bar F are lifting arms 7 which are spaced apart longitudinally of the bar and each of which has one end pivotally connected to the bar at 8 on an axis transverse of the bar. The other end of each arm has a finger 9 which has a top surface 10 in a plane perpendicular to its arm to underlie the flange D and also has a front surface 11 to approximately conform to a portion of the wall A beneath said flange as best shown in FIGS. 1 and 4. In the present instance the front surface 11 is arcuate and of a radius approximately corresponding to the radius of the support wall.

The lifting apparatus also includes two relatively vertically slidable and separable guide elements associated with each lift means or jack, one element 12 being stationarily related to its jack and shown as projecting rigidly upwardly from the jack base. The other element 13 is fixedly connected at one end to one end of the load carrying bar. The guide elements 13 on the load carrying bar are applicable to and separable from the associated element 12 upon vertical lowering and raising of the bar, respectively and the guide elements 12 and 13 are also relatively movable horizontally to locate the lift means or jacks and the load carrying bar in proper relation to the object to be lifted. The handles 5 on the jack bases facilitate the sliding of the jacks horizontally on the pavement surface C'. In use of the apparatus the jacks are set upon the supporting surface such as the pavement at opposite sides of the support wall and the load carrying bar is set on the piston rods 4 of the jacks, the guide elements 13 vertically sliding on the guide elements 12 and the lifting arms 7 being swung toward each other so as to enter the opening in

the support wall until the fingers 9 are disposed below the flange D with the arms adapted to abut the flange and the fingers adapted to abut the inner surface of the support wall. For holding the arms in spaced apart relation and with their fingers underlying the flange D, a spreader bar G is utilized, said bar having forked ends 14 each to straddle and abut one of the lifting arms as best shown in FIG. 1 where the spreader bar is shown in broken lines as being inserted between the arms. To limit the downward movement of the spreader bar and to support it in operative position, each lifting arm has a lug 15 projecting toward the other arm and on which rests the spreader bar as shown in FIG. 1. When it is desired to elevate or lift the support wall, the jacks are operated to elevate the load carrying bar so that the fingers 9 engage the undersides of the opposite portions of the flange D whereupon further upward movement of the load carrying bar will raise the support wall A.

While the guide elements may be constructed in different ways, preferably and simply each guide element is channel shaped and each element 13 is secured to the load carrying bar with its channel facing outwardly from the bar toward one end of the bar and the other piece is rigidly connected to the jack base and disposed within the channel of the associated element 13 as best shown in FIG. 1. The apparatus embodying the invention thus provides for easy and quick assembly and disassembly of the load carrying bar and the lift means and also provides for rapid and controlled precise vertical movement of the object being lifted.

I claim:

1. Apparatus for use in vertically lifting an object having an opening whose wall has opposite inwardly projecting portions, said apparatus comprising lift means disposed at opposite sides of said object, a load-carrying bar supported at its ends by said lift means, lifting arms spaced apart longitudinally of said bar and each having one end pivotally connected to said bar on an axis transverse of the bar and having its other end formed with a finger to extend beneath one of said projecting portions when said bar is supported on said lift means in transverse relation to said opening, and a spreader bar adapted to be removably interposed between said arms to spread them apart and hold said fingers in lifting engagement with said inwardly projecting portions.

2. Apparatus as defined in claim 1 wherein each of said fingers has a top surface in a plane perpendicular to its arm to underly said projection and also has a front surface to approximately conform to the portion of said wall beneath said projection.

3. Apparatus as defined in claim 1 wherein each lift

means includes a jack having a vertically movable lifting element and there are two relatively vertically slidable and separable guide elements associated with each jack, one element stationarily related to its jack and the other element fixedly connected to the corresponding end of the load-carrying bar.

4. The apparatus as set forth in claim 3, wherein each said guide element on the load-carrying bar is applicable to and separable from the associated guide upon vertical lowering and raising of said bar, respectively.

5. Apparatus as defined in claim 4 wherein the guide elements associated with each jack are also relatively movable horizontally to locate the lift means and the load-carrying bar in proper relation to the object to be lifted.

6. The apparatus as defined in claim 2 wherein said spreader bar has forked ends each to straddle and abut one of said lifting arms.

7. The apparatus as defined in claim 2 wherein said spreader bar has forked ends each to straddle and abut one of said lifting arms and each arm has a lug extending toward the other arm to support said spreader bar between the arms.

8. The apparatus as defined in claim 3 wherein the relatively vertically slidable and separable guide elements comprise two channel shaped pieces having their channels facing in the same direction, one piece secured at one end to said load-carrying bar with its channel facing outwardly from the bar, and the other piece being rigidly connected to the corresponding jack with the jack disposed in said channel whereby the channel piece on the jack can be moved horizontally into and out of the channel piece on the load-carrying bar.

9. The apparatus as defined in claim 3 wherein each jack includes a base, and the relatively vertically slidable and separable guide elements comprise a post projecting rigidly vertically from said base of the jack and a channel shaped piece secured at one end to the load-carrying bar with its channel facing outwardly from the bar to embrace said post.

10. Apparatus for use in vertically lifting an object, said apparatus comprising lift means disposed at opposite sides of said object, a load-carrying bar supported at its ends by said lift means, means to connect said bar to said object, each lift means including a jack having a vertically movable lifting element to underly said bar and there being two relatively vertically slidable and separable guide elements associated with each jack, one element stationarily related to its jack and the other element fixedly connected to the corresponding end of the load-carrying bar.

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